

REMARKS

Claims 1-23 are pending in the application. Claims 1-23 are rejected. Claims 1, 5, 7-11, 16-18, 22 and 23 have been amended for clarity and to correct for antecedent bases. Claim 4 has been canceled. No new matter is introduced with these amendments.

Reply to the Rejection of Claim 5-18, 22 and 23 under 35 U.S.C. § 112, 2nd Paragraph

The Examiner has rejected Claims 5-18, 22 and 23 as being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as the invention. Specifically, the Examiner states -

Within claim 5, the language, “said reactive sites”, lacks antecedence.

Within claim 7, the language, “said cross-linking agent”, lacks antecedence. Furthermore, the species, polymeric MDI and polymethylene polyphenyl isocyanate (PAPI) are the same; it is unclear what both have been claimed. Also, the Markush group is improper, because the species should be referred to in the alternative. Lastly, it cannot be determined what compounds are encompassed by the language, “its analogs” (both occurrences).

Within claim 8, the language, “said nucleophile”, lacks antecedence.

Within claims 9 and 10, it is unclear how a backbone can comprise the specified compounds. If the compounds react to form the backbone, then the backbone would comprise the residues of the compounds.

Within claim 11, it is unclear what constitutes a “suitable” solvent. What conditions must be satisfied in order for the solvent to be suitable?

Within claims 16, 17, 22, and 23, the specified ratio ranges are confusing, because the range can be misinterpreted. For example, the range 0.1 to 0.9 could be read as 0.1:0.9. The examiner suggests that the ratio ranges be amended as follows to resolve any ambiguity: 0.1:1 to 0.9:1 or 0.1 to 0.9:1.

Claims 5, 7, 8-11, 16, 17, 22 and 23 have been amended. It is believed that these amendments overcome the Examiner’s rejection of those claims as being indefinite. Withdrawal, therefore, of the rejection of claims 5-18, 22 and 23 under 35 U.S.C. § 112, second paragraph is respectfully requested.

Reply to the Rejection of Claim 11-18 under 35 U.S.C. § 112, 2nd Paragraph

The Examiner has rejected Claims 11-18 as being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as the invention. Specifically, the Examiner states -

The process of claim 11 is confusing, because it specifies that the carbodithioic acid salt is reacted with the cross-linking reagent; however, it is actually the reactive sites that react with the crosslinking reagent.

Claim 11 has been amended. It is believed that these amendments overcome the Examiner's rejection of those claims as being indefinite. Withdrawal, therefore, of the rejection of claims 11-18 under 35 U.S.C. § 112, second paragraph is respectfully requested.

Reply to the Rejection of Claims 1-3, 8, 9 and 19-23 under 35 U.S.C. § 102(b)

The Examiner has rejected Claims 1-3, 8, 9 and 19-23 as being anticipated by U.S. Patent No. 4,518,760 to Smith *et al.* ("Smith"). Specifically, the Examiner states –

The structures at column 4, line 55 is considered to meet applicants' claims 1-3, 8, and 9. Furthermore, the subject matter of claims 19-23 is considered to be met at column 5, lines 24+.

For the following reasons, Applicants respectfully traverse the Examiner's rejection of claims 1-3, 8, 9 and 19-23 as being anticipated by Smith.

Smith is directed towards a two-stage process for producing poly(dithiocarbamate) chelating resins (col. 2, lines 36-37). According to the invention of Smith, in stage one a polyimine is dissolved in an alcohol solvent to form a polyimine solution (Abstract; col. 2, lines 37-40). A polyisocyanate is added to this solution to produce a crosslinked polyamine-polyurea precursor resin (Abstract). In stage two, this resin is then mixed with a mixture of NH₄OH and CS₂ to produce a poly(dithiocarbamate) resin chelating agent (Abstract; col. 2, lines 40-43).

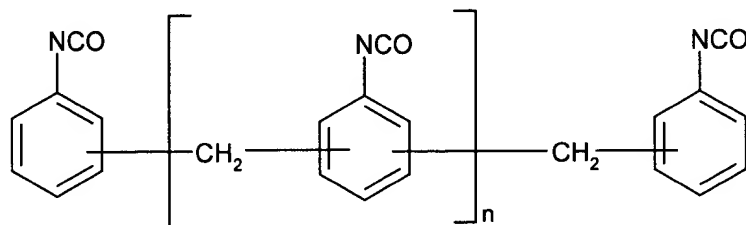
Useful polyimines have a molecular weight of about 1000 to about 100,000 and the general formula –



where R is H or an alkyl group having from 1 to about 4 carbon atoms and x is a positive number large enough to provide the desired molecular weight for the polyimine (col. 2, lines 44-56). Preferred polyimines include polyethyleneimine ("PEI" being most preferred), poly(2-methylethyleneimine) and poly(2-ethylethyleneimine) (col. 2, lines 60-63).

Suitable alcohol solvents for the polyimine are aliphatic alcohols having from 1 to about 6 carbon atoms, and preferably is isopropyl alcohol (col. 2, line 66 – col. 3, line 6).

Polyisocyanates that can be added to the polyimine solution include those that have the general formula –



where $n = 0, 1, 2, 3$ and mixtures thereof, as well as aliphatic diisocyanates such as hexamethylene diisocyanate having the formula –



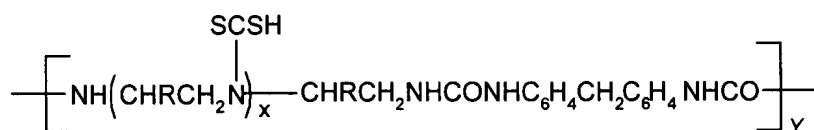
(col. 3, lines 7-24).

The polyisocyanate can be added directly to the polyimine solution, or can be added as a solution in an aliphatic ether having from 1 to about 6 carbon atoms in each chain, preferably diethyl ether (col. 3, lines 25-34).

This first stage reaction of the polyimine solution and the polyisocyanate (with or without the aliphatic ether) forms a crosslinked polyamine/polyurea precursor resin that is a function of the starting materials used and the ratio of the reactants (col. 3, lines 35-54).

In the second stage of the process, the precursor resin is suspended in an aliphatic alcohol (preferably isopropanol) and then mixed with NH_4OH and CS_2 to form the final poly(dithiocarbamate) resin (col. 4, lines 15-20). Preferably, an excess amount of CS_2 is employed (col. 4, lines 31-32). This produces a flaked poly(dithiocarbamate) resin (col. 4, line 37).

The exact formula of the finished poly(dithiocarbamate) resin of Smith is unknown (col. 4, line 49). However, it is believed to be of the general formula –



where x and y are functions of the particular imine and isocyanate compounds used (col. 4, lines 50-58).

The poly(dithiocarbamate) resin of Smith can be used in various conventional methods of absorption such as packed towers or fixed or fluidized bed systems (col. 5, lines 24-35). It can also be prepared in various ways, such as with a carrier material (*e.g.*, diatomaceous earth and activated charcoal), to expand its surface area (col. 5, lines 36-51).

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). "When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art." *Brown v. 3M*, 265 F.3d 1349, 1351, 60 U.S.P.Q.2d 1375, 1376 (Fed. Cir. 2001) (claim to a system for setting a computer clock to an offset time to address the Year 2000 (Y2K) problem, applicable to records with year date data in "at least one of two-digit, three-digit, or four-digit" representations, was held anticipated by a system that offsets year dates in only two-digit formats). See also M.P.E.P. § 2131.02. "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsisimilis verbis* test, *i.e.*, identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990).

In contrast to Smith, the poly(dithiocarbamate) resin of the present invention is formed by reacting a polyimine with CS₂ in an aqueous solution and neutralizing the carbodithioic acid with a base such as sodium hydroxide. The carbon disulfide reaction provides a carbodithioic group attached to the polyimine. Due to the attached carbodithioic groups, this intermediate product can function as a chelating resin. The intermediate can then be further reacted with a crosslinker to produce another form of the chelating resin. This product can be, for example, a polymeric dithiocarbamate where a polymer crosslinker such as poly MDI is used, or simply a dithiocarbamate by use of another (non-polymeric) crosslinker.

Smith only discloses the carbodithioic group 'SCSH', pendant to the reaction product of the polyimine and the polyisocyanate crosslinker (col. 4, lines 50-55). Smith does not teach or

suggest the use of a base such as sodium hydroxide in neutralizing the chelating resin product of the reaction of a reactive hydrophobic backbone, such as a polyimine, with CS₂, thereby creating a dithiocarbamate product having pendant carbodithioic groups. Further, Smith does not teach or suggest the subsequent reaction of this dithiocarbamate product with a crosslinking reagent such as a polyisocyanate. Additionally, Smith does not limit the amount of CS₂ used in its reaction. Smith also does not teach or suggest the weight ratio of filler to resin, only stating that a carrier material can be used to enlarge the surface area of the resin. Accordingly, Smith cannot be said to teach or suggest the chelating resin of amended claim 1 as its product is produced by a different process, thereby resulting in a different product.

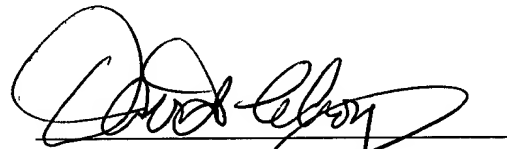
Further, the Examiner has stated that claim 4 would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. Claim 1 has been amended to include the limitation of claim 4 (now canceled). Although claim 4 did depend from claim 3, Applicants have not incorporated the limitation of claim 3 into claim 1. This is because, as noted above, depending upon the crosslinker used in the process, the product may not be polymeric, but simply, *e.g.*, a dithiocarbamate. Therefore, Applicants believe that the incorporation of claim 3 into claim 1 is not warranted.

It is believed that these remarks overcome the Examiner's rejection of claims 1-3, 8, 9 and 19-23 as being anticipated by Smith under 35 U.S.C. § 102(b). Withdrawal of the rejection is respectfully requested.

It is believed that the above remarks overcome the Examiner's rejections of the claims under 35 U.S.C. §§ 112, second paragraph and 102(b) as indicated herein above. Withdrawal of the rejections is therefore respectfully requested. Allowance of the claims is believed to be in order, and such allowance is respectfully requested.

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